

## CHAPTER 19 – PRELIMINARY ENGINEERING AND DESIGN

### 19.1 OVERVIEW

Various FDOT publications contain information on procedures, criteria, and standards for guiding and controlling preconstruction activities. These activities include project development, preliminary engineering analyses, environmental impact documentation, location surveys, right of way mapping, roadway and bridge/structures designs and the development of plans, specifications and estimates (PS&E). The Offices of Planning, Environmental Management, Right of Way, Design, and Program Management develop and control these manuals, guidelines, and standards. Local Agencies must work with these offices through the District LAP Administrator for current criteria, procedures, and standards that may apply to the design of a project.

### 19.2 PROJECT DEVELOPMENT AND ENVIRONMENT PHASE

The Project Development and Environment (PD&E) phase consists of the evaluation of project potential impacts on natural, physical, social and cultural environment. In this phase, various project alternatives are developed and analyzed to assess project impacts on the environment. Project alternatives may include geometric alignments and typical sections that avoid or minimize environmental impacts. Additionally, design parameters that support project progression from concept and preliminary design to final design are established during PD&E. Interagency coordination and public involvement must be conducted throughout the entire duration of the process to identify project impacts, permit requirements, commitments and funding sources.

Each local agency project must comply with the ***National Environmental Policy Act (NEPA)***, ***FDOT Project Development & Environment Manual (Topic No. 650-000-001)*** and the ***LAP Manual, Chapter 11***.

### 19.3 LOCATION SURVEYS AND RIGHT OF WAY MAPPING

Field survey data for engineering and related right of way mapping activities may be required in the project development phase and will almost always be required in the final design of local projects. For Location Survey and Right of Way Mapping activities and products, Local Agencies should refer to ***Topic 550-030-101, Surveying and Mapping*** for guidance and may additionally use the ***FDOT Surveying and Mapping Handbook***, as a reference, but all such activities must comply with the ***Rule Chapter 5J-17, Florida Administrative Code pursuant to Chapter 472, F.S.*** Where applicable, survey work

must obey and the State Jurisdiction Boundary Surveys of the Department of Environmental Protection.

## 19.4 ROADWAY AND STRUCTURES DESIGN

Design criteria are intended to ensure that transportation projects are safe, economical, and fully functional transportation facilities. The Department supports the use of the highest level of criteria and standards that is practical for all facilities according to good engineering practice. Local agencies should determine and document which standards apply when preparing the project prospectus and application for federal funds. There are many local, state, and federal laws, rules, and executive orders that may impact the design of a project.

The application of appropriate design criteria is dependent upon the LAP Project Classification. Classifications are determined by three primary factors: 1) highway system location, 2) total project cost, and 3) bridge/structures scope components.

LAP projects may be one of four types of classifications.

- **Class A-** On the State or National Highway Systems.

*Further information on roadways included in the National Highway System is found at the Department's Transportation Statistics Office website: [National Highway System Maps](#).*

- **Class B-** Off the State and National Highway Systems with an estimated construction value of \$10 million or greater.
- **Class C-** Off the State and National Highway Systems and includes structural components inclusive of a vehicular bridge, a pedestrian bridge over a roadway, or a box culvert that meets the definition of a bridge.
- **Class D-** Off the State and National Highway Systems; may include structural components inclusive of pedestrian bridges not over a roadway, bridges on multi-use paths not over a roadway, and box culverts that do not meet the definition of a bridge.

*A bridge is defined per [23 CFR 650.305](#) as a structure including supports erected over a depression or an obstruction, such as water, highway, or railway, and having a track or passageway for carrying traffic or other moving loads, and having an opening measured along the center of the roadway of more than 20 feet between undercopings of abutments or spring lines of arches, or extreme ends of openings for multiple boxes; it may also*

*include multiple pipes, where the clear distance between openings is less than half of the smaller contiguous opening.*

The project classification not only determines the minimum design criteria and standards, but also determines which construction specifications and related materials testing requirements are applicable to a project. Additional information on incorporating the appropriate project construction specifications and materials testing requirements is provided in **Chapter 20** of this Manual. An illustration of how design standards, construction specifications and materials testing requirements are tied to project classifications is shown in **Table 1** on the next page.

**Table 1** identifies the minimum criteria required for a LAP project, Local Agencies may use standards above the identified minimums to develop projects.

**TABLE 1: Project Classifications**

*\*Full Manual titles and Topic Numbers are identified in the following paragraphs and Chapter 20*

Project Classifications	Design Criteria and Standards*	Specifications*	Materials*
<b>Class A</b> On the State or National Highway Systems	<a href="#">FDOT Plans Preparation Manual</a> and <a href="#">FDOT Design Standards</a>	<a href="#">FDOT Standard Specifications for Road &amp; Bridge Construction</a>	<a href="#">Samples Testing and Reporting Guide</a> and <b>FDOT Materials Manual</b>
<b>Class B</b> Off the State and National Highway Systems with an estimated construction value of \$10 million or greater.	<a href="#">FDOT Plans Preparation Manual</a> and <a href="#">FDOT Design Standards</a>	<a href="#">FDOT Standard Specifications for Road &amp; Bridge Construction</a>	<a href="#">Samples Testing and Reporting Guide</a> and <b>FDOT Materials Manual</b>
<b>Class C</b> Off the State and National Highway Systems and includes structural components: <ul style="list-style-type: none"> <li>a vehicular bridge</li> <li>pedestrian bridge over a roadway</li> <li>box culvert meeting the definition of a bridge as stated in <a href="#">23 CFR 305</a></li> </ul>	1) For structures components, use the <a href="#">FDOT Plans Preparation Manual</a> and <a href="#">FDOT Design Standards</a>  2) For all other components, use the <a href="#">Florida Greenbook</a>	1) For the structures components, <a href="#">FDOT Standard Specifications</a>  2) For all other components, <a href="#">LAP Big 4 or approved Local Agency Specs</a>	1) For structures components, use the <a href="#">Samples Testing and Reporting Guide</a> and <b>FDOT Materials Manual</b>  2) For all other components, use Local Agency materials testing process
<b>Class D</b> Off the State and National Highway Systems, may include structural components: <ul style="list-style-type: none"> <li>pedestrian bridges not over a roadway</li> <li>bridges on shared use path not over a roadway</li> <li>box culverts that do not meet the definition of a bridge as stated in <a href="#">23 CFR 305</a></li> </ul>	<a href="#">Florida Greenbook</a>  -Or-  Approved Minimum Design Standards chosen by local agency which conform to the minimum criteria provided in <a href="#">Florida Greenbook</a>	<a href="#">LAP Big 4 or approved Local Agency Specs</a>	Local Agency materials testing process

For **Class A** construction projects, **Class B** construction projects and the structures components in **Class C** projects apply the [Plans Preparation Manual](#) (**Topic No. 625-000-007**) (commonly referred to as the **PPM**), [Design Standards](#) (**Topic No. 625-010-003**), and the [Utility Accommodation Manual](#) (**Topic No. 710-020-001**) (commonly referred to as the **UAM**).

The **PPM** is reviewed by FHWA annually, which designates its application for National Highway System (NHS) projects per **23 CFR 637.201-207**. NHS projects must meet FHWA's quality assurance criteria as describe in the referenced CFR. Since the state's process is the only process "approved" by FHWA, all NHS projects must use the FDOT's approved design criteria, specifications, and construction quality assurance program (the **FDOT Construction Project Administration Manual** or **CPAM** is the approved construction QA program).

For the Class C non-structural components and Class D construction projects apply the **Manual of Uniform Minimum Standards for Design, Construction and Maintenance for Streets and Highways**, commonly known as the [Florida Greenbook \(Topic No. 625-000-015\)](#). The Florida Greenbook provides uniform minimum standards and criteria for the design, construction, and maintenance of all public streets, roads, highways, bridges (as defined by [23 CFR 650.305](#)), sidewalks, curbs and curb ramps, crosswalks, bicycle facilities, underpasses, and overpasses used by the public for vehicular and pedestrian traffic.

Additional requirements for the design and construction of transportation facilities include the:

- [Manual on Uniform Traffic Control Devices](#) (commonly known as the **MUTCD**),
- [2006 Americans with Disabilities Act Standards for Transportation Facilities](#) as required by **49 CFR 37.41** or **37.43**, and the
- [2012 Florida Accessibility Code for Building Construction](#) as required by **Rule 61G20-4.002, F.A.C.**

For situations where specific design criteria and standards are not currently addressed in Department publications, use current approved technical publications, such as **A Policy on Geometric Design of Highways and Streets**, **American Association of State Highway and Transportation Officials**, **AASHTO Guide for the Development of Bicycle Facilities** and **AASHTO Guide for the Planning, Design and Operation of Pedestrian Facilities** as design guidelines. Local agencies must ensure that project designs meet or exceed the referenced design criteria and that the standards developed are appropriate for the proposed facility.

The [FDOT Design Office's Documents and Publications webpage](#) provides a listing of publications that establish the criteria for the critical areas of Roadway and Bridge/Structure designs.

## 19.5 DESIGN EXCEPTIONS, UTILITY EXCEPTIONS, AND DESIGN VARIATIONS

The Local Agency must identify all Design Exceptions and Design Variations for the project early on during PD&E or initial engineering design phase, as appropriate. This allows time for designers to evaluate design alternatives and to obtain Design Exceptions and Design Variations approval before plans are in the final design phase.

Design Exceptions, Design Variations, and Utility Exceptions must be prepared and submitted for review according to the governing design criteria. If the project is on the SHS or NHS, the Engineer of Record (EOR) shall obtain approval consistent with the [PPM, Volume 1, Chapter 23 – Design Exceptions and Design Variations](#). If the project is off the SHS and NHS, the EOR obtains approval of the Design Exceptions, consistent with the [Florida Greenbook, Chapter 14 – Design Exceptions](#). For all utilities located on State Facilities, the criteria in the **Utilities Accommodation Manual (UAM)** govern, and the Utility Agency/Owner (UAO) must use the Utility Exception processes found therein.

## 19.6 PROPRIETARY PRODUCTS

The use of patented and/or proprietary products may only be used with approval from the Department. The local agency shall follow the Department's [Proprietary Products Review and Certification Procedure \(Topic No. 630-020-005\)](#) to obtain approval for use of proprietary products or materials on LAP projects. A [Proprietary Products Certification \(Form No. 630-020-07\)](#) should be completed and submitted to the District LAP Administrator no later than the 60% design plans submittal.

As provided in **23 CFR 635.411(a)(2)**, a certification is acceptable when the proprietary or patented item is either:

- Essential for synchronization with the existing highway facilities, or
- A unique product for which no equally suitable alternative exists.

When more than one acceptable product or process is available for use and the local agency seeks to limit purchase to a specified product or process, a Public Interest Finding (PIF) must be submitted in lieu of obtaining a certification. All PIFs must be approved by FHWA. Contact your District LAP Administrator to verify whether a request requires use of a Proprietary Products Certification or a PIF.

### 19.6.1 Approved Products List

The Department maintains a database that identifies products that have been approved for use on SHS and NHS called the [Approved Products List](#) (APL). The products are listed by Specification, Structures, or Design Index reference that identifies the product or material requirements. If a desired product for a LAP project is not on the APL, the Local Agency or their engineer may contact the District LAP Administrator for further assistance.

## 19.7 LOCAL AGENCY RESPONSIBILITIES

Funding for the design phases of LAP projects varies from project to project. Whether the department reimburses the local agency for the design or the local agency funds the design work itself, the Department must review and accept design plans prior to construction for all LAP projects. Specific details on executing a LAP Agreement and procuring a Federal-Aid participating design contract may be found in **Chapters 5 and 18** of the **LAP Manual**.

### 19.7.1 Use of Department Technology for Project Administration and Review

The local agency is required to use the Department's [Electronic Review Comments](#) (ERC) application and [LAPIT](#) for submission of various documents during the design phase, as applicable. Specific documents are identified in the **Manual**, but coordination with the District LAP Teams for periodic updates and project specific requirements may be required of the Local Agency. Department staff may request any documentation required to administer and monitor LAP projects. Furthermore, Local Agencies should subscribe to the [Department's Contact Mailer](#) system for design updates. Contact Mailer is the Department's primary mechanism for notifying our customers of changes that impact the way the Department and our partners do business.

### 19.7.2 Design Phase Review Process

The process outlined in this chapter represents a high level outline of how a design phase may be administered by the Department. **Figure 1: Design Phase Submittals Flowchart** provides an overview of the general LAP project design process and those elements in the process requiring Department review and acceptance in order to obtain Federal Authorization for the construction phase of the project. Due to the nature of construction projects, the Districts must establish a detailed process tailored to each project. Contact the District LAP Team to coordinate a schedule and specific requirements for your project.

In addition, [Chapter 2, Volume 2 of the PPM](#) contains **Figure 2.1 “Summary of Phase Submittals”**, which provides an excellent guide to what sheets are expected at each phase submittal and whether the sheets should be preliminary, complete, or final.

The number of phase submittals, complexity of right of way acquisition, and environmental impacts may vary by project. **Chapter 12** contains detailed information on the LAP right of way acquisition process. **Chapter 11** contains detailed information on the environmental documentation process (**NEPA**).

## 19.8 RESOURCES

[FDOT Project Development & Environment \(PD&E\) Manual](#) (Topic No. 650-000-001)

FDOT’s Right of Way Mapping Policy (Topic No. 550-030-015)

[FDOT Right of Way Mapping Handbook](#)

[Plans Preparation Manual](#) (Topic No. 625-000-007)

[FDOT Construction Project Administration Manual \(Topic No. 700-000-000\)](#)

[Utility Accommodation Manual](#) (Topic No. 710-020-001)

[Florida Greenbook](#) or the Manual of Uniform Minimum Standards for Design, Construction and Maintenance for Streets and Highways (Topic No. 625-000-015)

[FDOT Design Office’s Documents and Publications webpage](#)

[Electronic Review Comments](#) (ERC) application

[LAPIT](#) application

[National Highway System \(NHS\) Maps website](#).

[FDOT’s Contact Mailer](#) system

**FIGURE 1: DESIGN PHASE SUBMITTALS FLOWCHART**

